

## ELECTRONIC DESORPTION OF TRIBLOCK COPOLYMER POLY (PROPYLENE SULFIDE-*BL*-ETHYLENE GLYCOL) (PPS-PEG) FROM INDIUM TIN OXIDE (ITO)

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**INTRODUCTION:** Protein-resistant triblock copolymer, poly(propylene sulfide-*bl*-ethylene glycol) (PPS-PEG) has been previously reported to chemisorb onto gold surfaces [1] with high oxidation stability [2]. In this work, we show the adsorption of PPS-PEG onto a transparent and electrically conductive substrate, indium tin oxide (ITO). In addition, we demonstrate the possibility of controlled desorption of PPS-PEG by applying an electrical stimulus.

**METHODS:** We have used three complementary surface characterization techniques: variable angle scanning ellipsometry (VASE), x-ray photoelectron spectroscopy (XPS) and time-of-flight secondary ion mass spectroscopy (ToF-SIMS) to analyze the adsorption and electro-desorption of triblock copolymer, PPS-PEG from an ITO surface.

**RESULTS:** All three methods confirmed the formation of PPS-PEG adlayer on the ITO surfaces.

Based on our experimental XPS and ToF-SIMS results and former publications [3], we postulate that the chemisorption of the PPS-PEG on ITO involves direct sulfide-indium interactions.

When an ascending anodic electrical stimulus was applied to the surface of the modified samples, a gradual and steady polymer removal was observed. At 2000 mV (reference to Ag electrode), a complete removal of the polymer from the polarized ITO surface was observed. Despite subjecting the surface modified samples to an external electrical field, no oxidation effect were observed hence indicating the excellent oxidation stability of PPS-PEG on ITO surfaces. This work is focused towards creating dynamic surface modifications by means of an electrical stimulus.

**DISCUSSION & CONCLUSIONS:** All the three surface characterizing techniques clearly showed consistent steady and gradual loss of PPS-PEG on the polarized ITO surface with ascending electrical

potential. No oxidized species from the polymer were detected despite an electrical polarization up to 2000 mV. The specific formation of PPS-PEG on ITO using an external electrical potential offers high oxidation stability as well as design flexibility for bioanalytical and biodiagnostic devices.

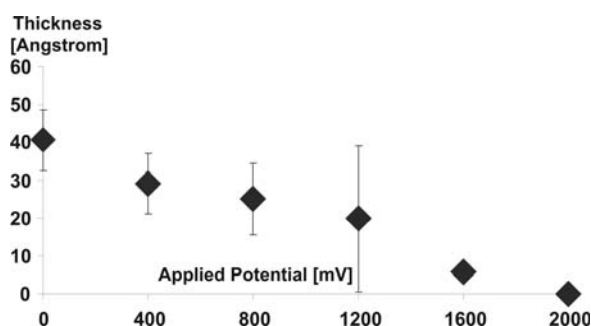


Fig. 1: A thickness-voltage plot obtained from the ellipsometry measurements depicts the amount of PPS-PEG on an electrically polarized ITO surface. At 0 mV, the ITO surface which was exposed to PPS-PEG has a thickness of 40 Å. As the electrical field is further increased, there is a steady reduction in the adlayer thickness until it reached 2000 mV whereby the thickness of the PPS-PEG on the ITO reaches zero. This suggests that the polymer has completely desorbed from the ITO surface.

**REFERENCES:** <sup>1</sup>L.M. Feller, S. Cerritelli, M. Textor, J.A. Hubbell and S. Tosatti, (2005) *Macromolecules* Submitted. <sup>2</sup>P. Bearinger, S. Terrettaz, R. Michel, N. Tirelli, H. Vogel, M. Textor and J.A. Hubbell, (2003) *Nature Materials* **2** 259. <sup>3</sup>S.H. Brewer, D.A. Brown and S. Franzen, (2002) *Langmuir* **18** 6857.

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